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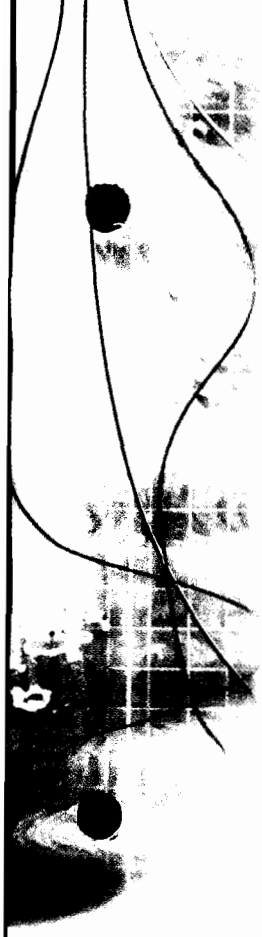
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OSICS EDFA

MODULAR
ERBIUM DOPED FIBER AMPLIFIER

USER MANUAL

MU/3615/ELT/001

photonetics

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SAFETY CONSIDERATIONS

Respect of the following safety precautions is vital to your health and instrument safety. If the equipment is used in the manner not specified by Photonetics in this user manual, the protection provided by the equipment may be impaired.

SYMBOLS AND TERMS:

The following symbols and terms may appear in this manual or on the equipment.

Terms in this manual:

WARNING	Warning statements identify conditions or practices that could result in injury or loss of life.
CAUTION	Caution statements identify conditions or practices that could result in damage to this product or other property.

Terms on the product:

DANGER	indicates an injury hazard immediately accessible as you read the marking.
WARNING	indicates an injury hazard not immediately accessible as you read the marking.
CAUTION	indicates a hazard to property, including the product itself.

Symbols on the product:

CAUTION (Refer to Manual)

Protective Ground (Earth) Terminal

CAUTION Risk of electric shock

Laser product (This warning label is located on the front panel of each module)



DANGER LABEL

(located on the rear panel of the OSICS mainframe)



DANGER LABEL

(located on the OSICS-ASE module side)

LASER SAFETY:

Amplifier type	Erbium doped fiber amplifier
Optical input and output	Single mode optical fiber
Output divergence (half angle @ 1/e_)	0.09 rad

LASER CLASS:

Standard	**Laser Class**
IEC 60825-1	Class 3B
21 CFR Subchapter J	Class IIIb

NOTE: the OSICS has a Remote Interlock Connector where a remote ON/OFF switch can be connected (Refer to Appendix F). The principle of this function is that if the interlock circuit is open, the output is set to the off state. The output may be turned on again by simply pressing the off/on switch, after corrective action is taken (if needed).

ABSOLUTE MAXIMUM RATINGS:

	EDFA
Wavelength range	1500 to 1600 nm
Peak power	70 mW (typ.)

WARNING: **The use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.**

WARNING: **The use of optical instruments with this product will increase eye hazard.** Under no circumstances look into the end of an optical cable attached to the optical output when the device is operational. The optical source radiation is not visible to the human eye, but it can seriously damage your eyesight. Keep the beam cap on after use to avoid laser radiation.

WARNING: Disable the optical source output before connecting, or disconnecting, a fiber optic cable on the instrument.

VENTILATION OF THE UNIT:

CAUTION: You must leave enough space under and behind the unit. The apertures (under the unit) and the fan (behind the unit) are used for the inside ventilation. Actually the air enters through these apertures and goes out through the fan.
This product is designed so that the feet should leave enough room under the unit to enable the ventilation. As a result if you want to integrate the unit in a rack you need to keep the feet or leave at least 15mm (0.6 inches) between two units.

POWER SOURCE:



WARNING: - OSICS is intended to operate from a power source that does not apply more than 265 volts RMS between the supply conductors or between either supply conductor and ground.

- OSICS has a chassis connected to earth via the power supply cable. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

- To avoid the possibility of injury, insert the power cable only into a socket outlet provided with a protective earth contact. Before switching on the instrument, check that the electrical installation fulfills the local safety requirements.

- Use only the power cord and connector specified for your product. This power cord should be in good condition.



WARNING: **DO NOT OPERATE WITHOUT COVERS:** To avoid personal injury, do not operate this product without covers or panels installed.



WARNING: **USE THE PROPER FUSE:** To avoid fire hazard, use only the fuse or correct type, voltage rating and current rating as specified in the Appendix D.



WARNING: **ENVIRONMENTAL CONDITIONS:**

- OSICS has not been designed for outdoor use.

- To avoid the possibility of injury, do not expose the instrument to rain of excessive moisture.

- Do not operate the instrument in the presence of flammable gases or fumes.

INTRODUCTION

OSICS is a 8-channel modular instrument allowing up to 8 different optical sources to be plugged in a single 19-inch rack :

OSICS-ECL : External Cavity Laser
OSICS-DFB : Distribution Feed Back laser diode
OSICS-ASE : Amplified Spontaneous Emission broadband source
OSICS-EDFA : Erbium-Doped Fiber Amplifier

The OSICS-EDFA modules are high-performance Erbium-Doped Fiber Amplifiers that operate in the 1.55 μm spectral window. This single pump version offers remarkable +17 dBm of saturated output power. Its co-propagating configuration (using 980 nm pump-diode) provides a low 4.5 dB (typ.) noise figure and is ideally suited as a source booster. The Amplifier is operated in "Constant Pump Power Mode". The pump power is adjusted by the end-user.

OPTICAL AMPLIFIER CHARACTERISTICS :

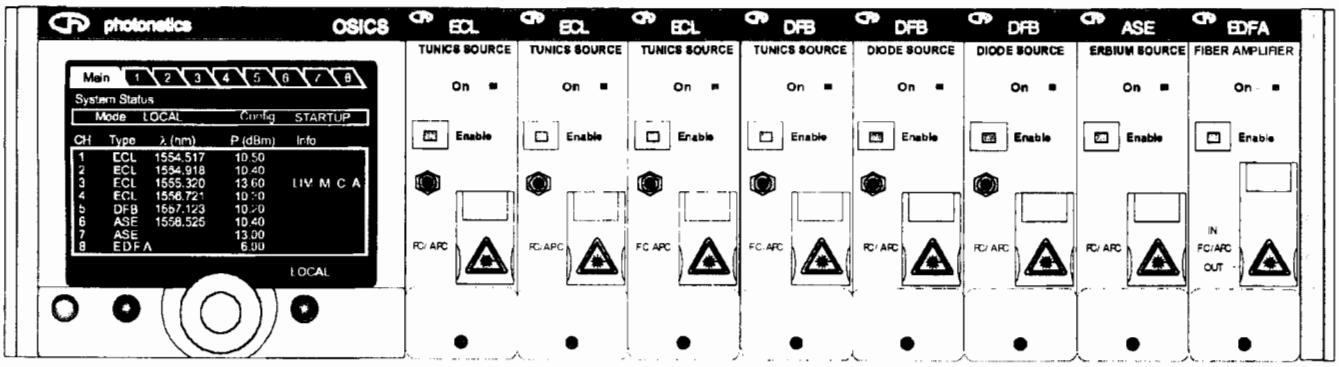
Wavelength range	1525-1560 nm
Output power (1)	>+ 17 dBm
Small signal gain (2)	> 25 dB (30 dB Typ.)
Noise Figure	< 6 dB (4 dB Typ.)
Polarization sensitivity of gain	< 0.5 dB
Spectral gain flatness @ -30 dBm (3)	3 dB Typ.

(1) Measured with 0 dBm input signal power @ 1550 nm
(2) Measured @ 1550 nm, -40 dBm input signal power
(3) Specified for a single channel @ -30 dBm over 1540-1560 nm

I. DESCRIPTION OF THE INSTRUMENT

I.1 Description of the front panel

The following drawing represents the front panel of the OSICS mainframe with OSICS-ECL, OSICS-DFB, OSICS-ASE and OSICS-EDFA modules.



Display window :

In the "System Status" menu mode, the "Main Setup" and the "EDFA Unit Setup" menu mode, the screen is used to display the various menu items and informations, to enter parameter values or to set operating modes for the mainframe and the plugged modules.

Description of the front panel elements :

• On the OSICS mainframe :

Left blue button: it gives access to the function displayed on the screen just over it.

Rigth blue button: it gives access to the functions displayed on the screen just over it.

Rotating knob: -This knob allows to change the numerical value of the selected parameter (refer to the III.1 section).
-This knob also allows to select between different choices in the menus displayed on the screen.
Note: the selected choice is enlightened on the screen.

Green button: ON/OFF key (enlightened when the mainframe is powered).

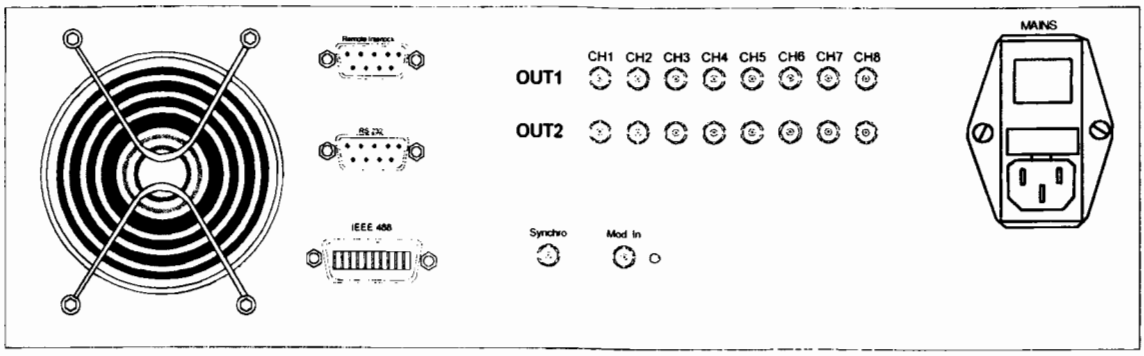
• On the OSICS-ASE module :

Enable: This key is used to enable or disable each channel separately. When the channel is enabled, the key light is on, the mainframe is emitting a beep and the power value is displayed on the "System Status" menu.
Note: A beep is emitted only when a mainframe software version from V.2.10 is used with a module software version from V.2.10 with at least a FPGA V.1.0.

On : This LED indicates that the channel is powered.

Output connector: Fiber optic output connector. The standard output connector is a FC/APC type connector.

I.2 Description of the rear panel



Cable connections on the rear panel of the OSICS mainframe

Mains switch : to power ON/OFF the instrument. For the connection of the instrument refer to the II.2 section.
To replace the line fuse please refer to the Appendix D.

RS232-C connector: enables a Remote control mode (refer to chapter IV) and used for the upgrade of the OSICS-ASE module software (refer to Appendix G).

IEEE 488-2 connector: enables a Remote control mode (refer to chapter V).

Synchro: mainframe synchronization output modulation BNC connector.

Remote Interlock connector: Sub-D9 connector used to connect a Remote ON/OFF switch (refer to "Safety considerations" chapter and Appendix F).

Mod. In: mainframe input modulation BNC connector. The green LED on the right side of the BNC connector is enlightened when the BNC connector is active for external modulation.

For channel 1 to channel 8:

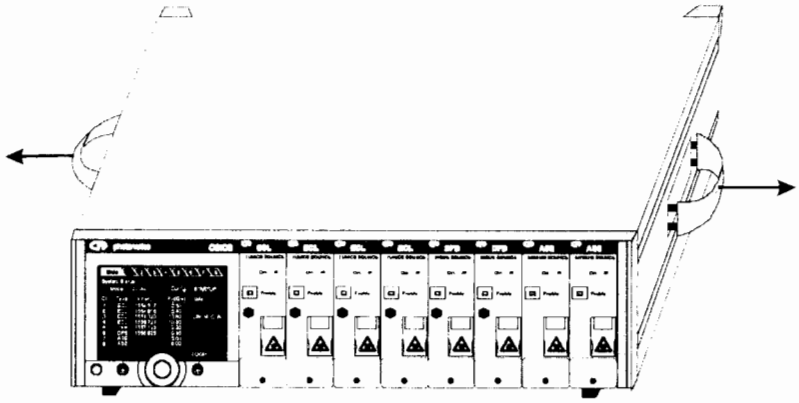
OUT1 : Analog (Power or Current) BNC output connector.

OUT2 : Modulation signal BNC output connector.

II. SETTING UP THE INSTRUMENT

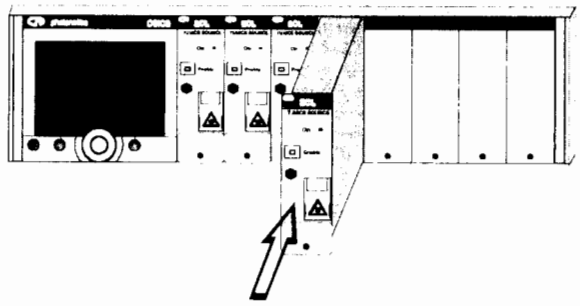
II.1. Instruction to carry the unit

To pull out the unit from its packaging or move it from place, use the **two** lateral retractable handles as shown on the drawing which allow to keep the instrument horizontal during carrying.



II.2. Inserting modules

Up to 8 differents modules may be plugged in the OSICS mainframe slots.
Unscrew the protective plate or an already plugged-in module with a screwdriver, plug your module as shown on the following drawing then screw it: the OSICS mainframe is now ready for use.



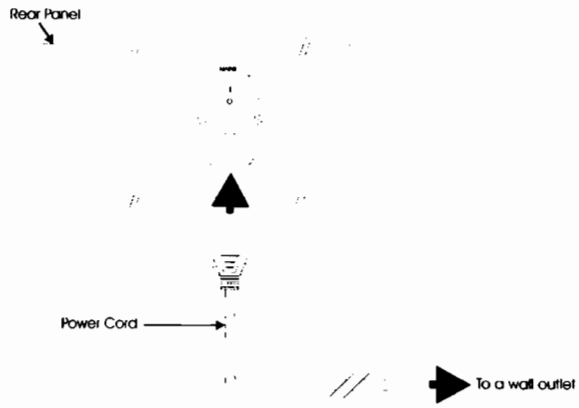
CAUTION: Turn off the OSICS mainframe before plug-in or unplug-in modules.

II.3. Connection of the instrument

CAUTION: To obtain the optimum performances of the system, it is recommended to place the optical head, or the instrument, on a stable surface isolated from any source of vibrations.

CONNECTION TO ELECTRICAL SUPPLY

Connect the power supply cable to the rear panel of the controller and then to the proper voltage mains supply point.



SWITCHING THE INSTRUMENT ON AND OFF

- To switch ON the instrument, set the main switch at the rear panel controller on the "I" position.
- Before moving the instrument, or when the instrument is not in use for long periods of the time, the main switch has to be set in the "O" position. In this case, the instrument is no longer powered.

OPTICAL CONNECTION

CAUTION: The cleanliness of the optical connectors are important to get the optimum performance of the system. Refer to the cleaning instructions in the Appendix D.

CAUTION: The standard output connector is FC/APC type connector. Never connect another type or connector on the optical output.

NOTE: In the case of frequent connections/disconnections the use of an intermediate jumper is recommended in order to prevent premature failure of the OSICS module internal connector.

II.4. System Initialization

CAUTION: If the OSICS unit has been turned off, it is **imperative** to wait at least thirty seconds before powering it up again.

Turn the rear panel mains switch on the "I" position.
During the initialization phase, the "[illegible]" message is displayed.

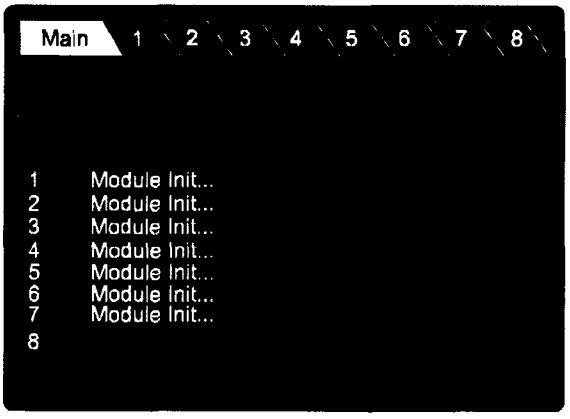
When the unit has been powered the user is asked for the key control code when the module is used with a mainframe software version from V2.10.

For laser safety reasons it is necessary to enter the instrument's password by using the rotating knob then pressing "[illegible]". Until the correct password is entered the laser output is disabled and the instrument cannot be used.



NOTE: The default password is 0000 but it should be changed into a new one (refer to the III.3.7 section).

Once the mainframe is fully initialized, each channel module is initialized, and set to the power-up wavelength. During this operation, the following screen is displayed:



The **Module init** message is only displayed on the display lines corresponding to equiped channels.

At the end of the initialization phase, each of the channels is set to default wavelength and power, as recorded in the configuration stored in system memory. This configuration can be user modified (cf. § III.3.6: configuration).

WARNING: For Laser safety reasons, OSICS has an **Enable** function to enable or disable the laser output. At the end of the initialization, OSICS is in the disabled mode (unless otherwise defined in a user modified configuration). To allow light emission use the Enable menu function in the "Main Setup" menu: all the OSICS modules plugged in the mainframe will be enabled. To enable only some modules press the Enable key on the selected modules. For laser safety reasons the OSICS mainframe is emitting a beep each time the OSICS-EDFA module is enabled (only on mainframe software version from V.2.10).

II.5. System shut down

To shut down the system press the green button located on the front panel. A "Saving Configuration..." message is displayed: the current configuration is saved as the STARTUP configuration. This configuration will be loaded during the next system power up.

CAUTION: You should avoid switching the unit off before the system is fully initialized.

III. USING OSICS COMMANDS

III.1. Entering numerical parameters

Some menu items require that the user enters numerical values. This is done through the use of the rotating knob. When a parameter can be modified, the current parameter value is displayed, and the first digit of this number is selected. The rotating knob can be used to select a digit, and then set this digit to the wanted value: a right rotation increases the value (a left rotation decreases the value).

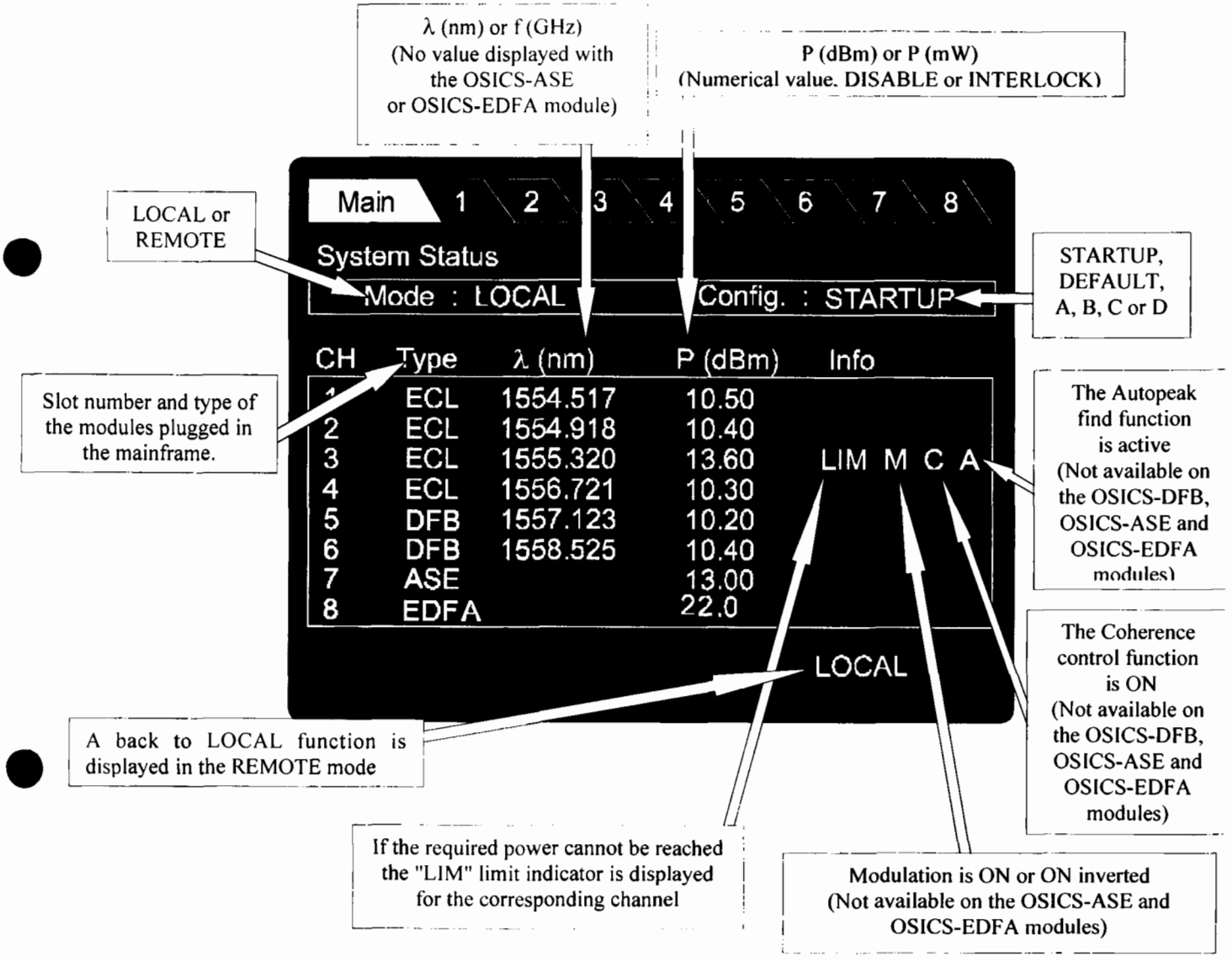
This procedure can be repeated for all required digits, until the displayed number is the desired new parameter value. The user must press the "ENTER" function and the corresponding system setting is immediately modified (output power, wavelength ...).

No changes are made on the system settings when the "ESCAPE" or "EXIT" are pressed.

The value on the screen can not be increased or decreased when the maximum or the minimum parameter values are reached. However these maximum and minimum parameter values are maximum and minimum software values : Photonetics only guarantees system specification over this range.

III.2 The OSICS "System Status" menu

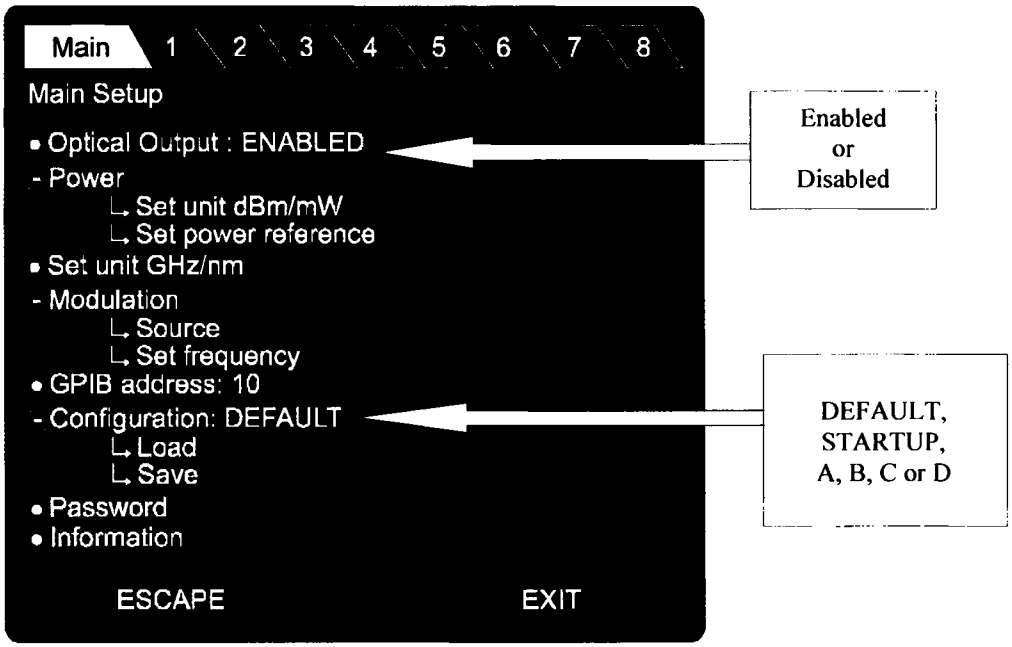
Operating modes and parameters of the OSICS mainframe and the modules plugged in are displayed in the OSICS "System Status" menu. This menu is displayed once the mainframe and the modules are initialized.



NOTE: If a failure occurs on the pump diode temperature control loop, the following message is displayed **ASE ERROR T Disabled**. In this case please refer servicing to authorized personnel from Photonetics.

III.3 Using the OSICS "Main Setup" menu

The purpose of the OSICS "Main Setup" menu is to define parameters for the mainframe and for every modules. The following menu is available when "MAIN" is selected by pressing the rotating knob in the "System Status" menu. The maximum power value is limited by the OSICS modules specifications.



The "•" and the "→" symbols indicates a direct choice for the user. The "+" symbol means that the user will have access to sub-menus (the "+" symbol becomes a "-" symbol when the sub-menus are displayed. The choices in the different menus are done with the rotating knob (see the III.1 section).

The "ESCAPE" and "EXIT" choices are available in nearly all the "EDFA Unit Setup" screens. They can be selected by the left blue button and the right blue button.

- With the "**ESCAPE**" choice it is possible to escape the current menu and go backward to the previous menu.

III.3.1 Optical output

With this function you enable or disable the optical output of all modules simultaneously by pressing on the rotating knob.

The modules are enabled and their front panel "Enable" key are lightened. The following message is displayed: **Optical Output : ENABLED**
When the modules are disabled the lights are turned off and the following message is displayed: **Optical Output : DISABLED**

NOTE: it is possible to enable or disable a module either through the "Main Setup" menu or through the module front panel key.

III.3.2 Power

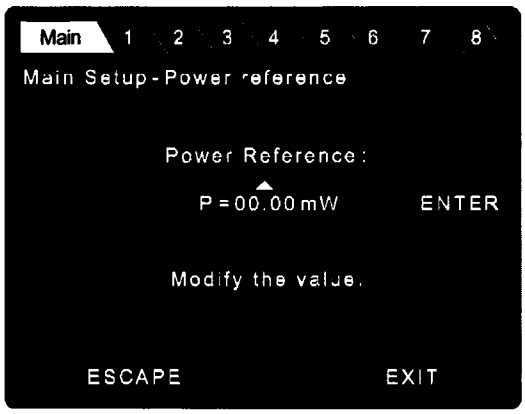
III.3.2.1 Setting unit dBm/mW

Optical powers can be expressed either in milliwatts or in dBm. The user can select one of these two units (mW or dBm) with the rotating knob. Every optical powers will be expressed in this unit in the different menus (for example in the "Power calibration" menu).



III.3.2.2 Setting power reference

This function may be used to set the same power on every OSICS modules. The maximum power value is limited by the OSICS modules specifications.

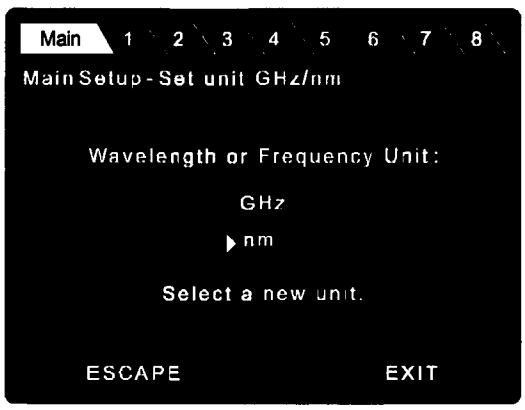


NOTE: The power reference value should be set inside the modules power range or the power value will not be modified.

III.3.3 Setting unit GHz/nm

The lightwave can be defined either by its wavelength (in nanometers) or by its optical frequency (in GHz).The user can select one of these two units (nm or GHz) with the rotating knob. All corresponding values (including wavelength step) will be displayed according to the selected mode (wavelength or optical frequency).

NOTE: This setting is only applicable to Osics-ECL and Osics-DFB modules but not to Osics-ASE modules.



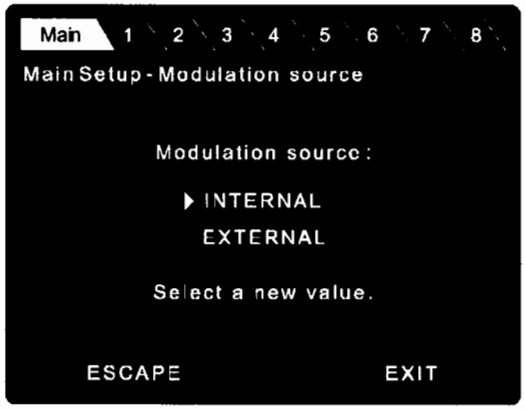
III.3.4 Modulation

III.3.4.1 Source

Two different modulation sources are available in the OSICS mainframe:

-Internal source: a signal is generated inside the OSICS mainframe.

-External source: a signal may be applied to the "Mod. In" BNC connector on the rear panel.

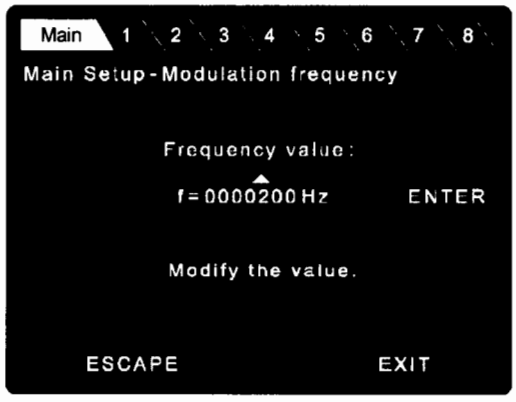


NOTE: This function is only applicable to OSICS-ECL and OSICS-DFB modules.

III.3.4.2 Set frequency

The frequency of the internally generated signal can be set between 200 Hz and 500 kHz (for maximum stability the frequency shouldn't be set outside this range).

However the internal generator cannot generate some frequency values: in this case the mainframe selects the frequency value just under the entered value and displays it on the screen.

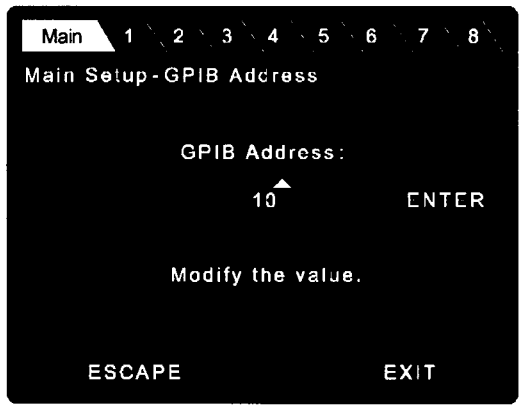


NOTE: a Synchro BNC connector on the rear panel may be used to synchronize the mainframe signal (on the externally or internally source).

NOTE: This function is only applicable to Osics-ECL and Osics-DFB modules.

III.3.5 GPIB address

This function is used to change the system IEEE 488 bus address. The default address is 10. Use the rotating knob for changing the GPIB address. The GPIB address must be a value between 1 and 30.



NOTE: The new GPIB address is saved into a system non volatile memory: this new GPIB address is retained even when the system is powered down.

III.3.6 Configuration

The configuration is composed of the mainframe settings and of the modules settings. These settings can be saved into a non-volatile memory.

Six different configurations are available in the memory:

- the DEFAULT,
- the STARTUP,
- and the A, B, C and D configurations.

The different kind of configurations stored in the memory:

- The **DEFAULT** configuration: used to restore the factory configuration.

Mainframe:
Power unit: mW
Wavelength mode (nm)
GPIB address= 10

OSICS-ASE module:
All optical output DISABLED
P= 0.0
Analog Out: POWER (AOUT= P)

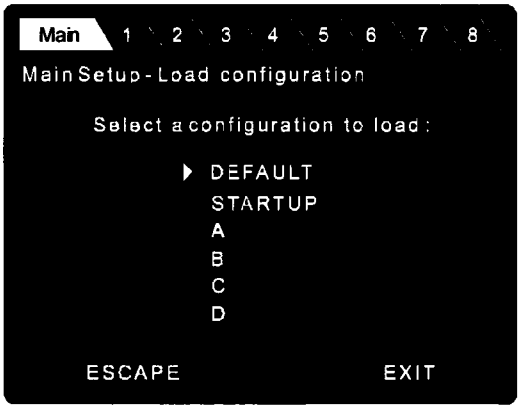
- The **STARTUP** configuration: saved when the mainframe has been turned off. The STARTUP configuration is loaded at each system power up and all optical output are always disabled.

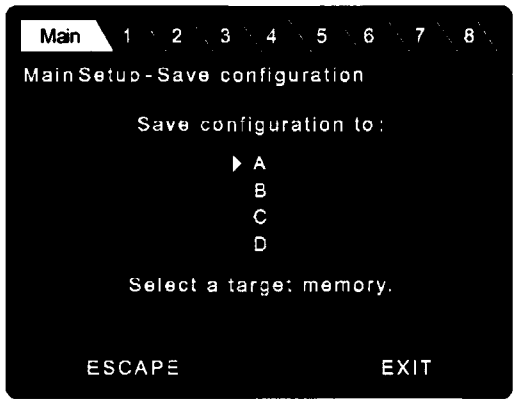
- The **A, B, C or D** configurations: used to save personalized configurations. This avoid tedious repetitive initial adjustments.

Mainframe:
Optical power unit: mW or dBm
Wavelength or frequency unit: nm or GHz
GPIB address
Mainframe modulation state (common to all modules)

OSICS-ASE module:
Optical output ENABLED or DISABLED
P value
AOUT value

Loading or saving a configuration: use the rotating knob to select the place in memory where you want to load (DEFAULT, STARTUP, A, B, C or D) or save (A, B, C or D) the configuration then press on it.





When loading a configuration the "[illegible]" message is displayed.

NOTE: the "[illegible]" message is displayed if a configuration (A, B, C or D) has no settings stored in memory.

III.3.7 Password

When the unit has been powered the user is asked for the key control code when the module is used with a mainframe software version from V.2.10. The password used during the system initialization may be changed into a new one. Before entering a new password the current one must be entered using the rotating knob then pressing "[illegible]". The new password will be taken into account for the next initialization.





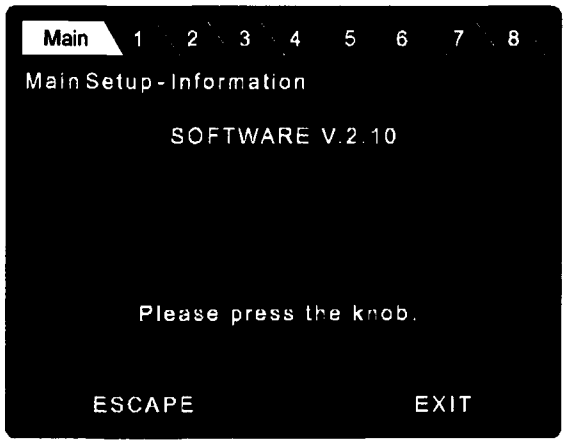
CAUTION: Remember the password set or the instrument will not be usable!!!

NOTE: If the current password entered is not correct the following message is displayed: "**The password is not correct**".

NOTE: The default password is 0000 but it should be changed into a new one by the user for laser safety reasons.

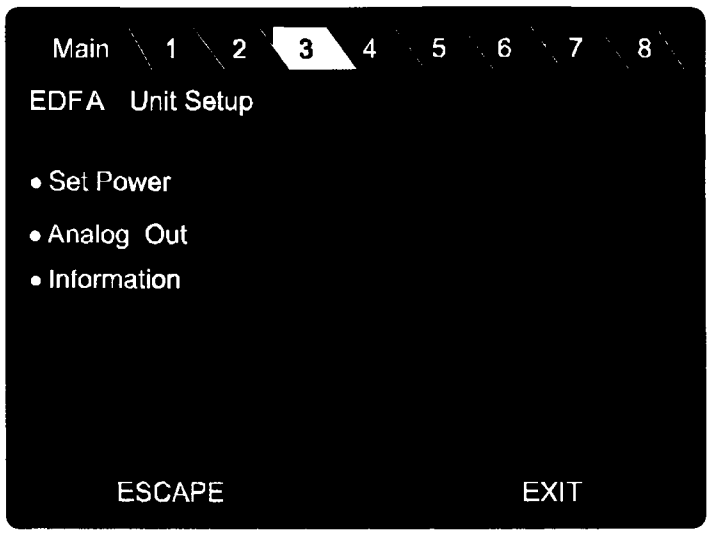
III.3.8 Information

When the Information sub-menu is selected the system displays the mainframe software revision version.



III.4 Using the "EDFA Unit Setup" menu

The "ASE Unit Setup" menu is used to set the parameters (optical power, wavelength, calibration...) of each module. When an OSICS-ASE module is selected the following main menu will be displayed on the screen (in the following screen example the 3rd module has been selected).



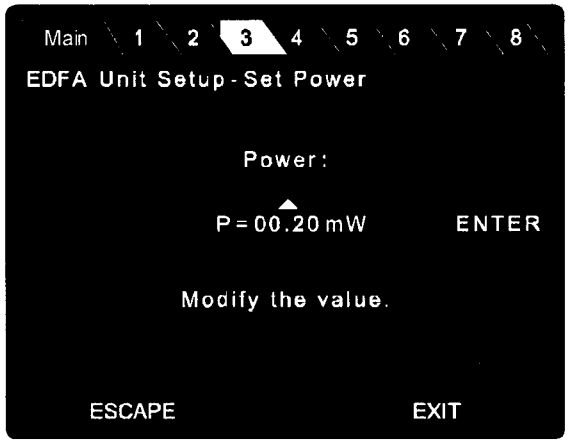
The "•" symbol indicates a direct choice for the user. The choice is done with the rotating knob (see the III.1 section).

The "ESCAPE" and "EXIT" choices are available in nearly all the "ASE Unit Setup"screens. They can be selected by the left blue button and the right blue button.

- With the "**ESCAPE**" choice it is possible to escape the current menu and go backward to the previous menu.
- With the "**EXIT**" choice it is possible to go back to the "System Status" menu and change some mainframe parameters or select another module (OSICS-ECL, OSICS-DFB or OSICS-ASE) and change its parameters.

III.4.1 Setting Power value

To change the OSICS-ASE module output power value use the rotating knob (please refer

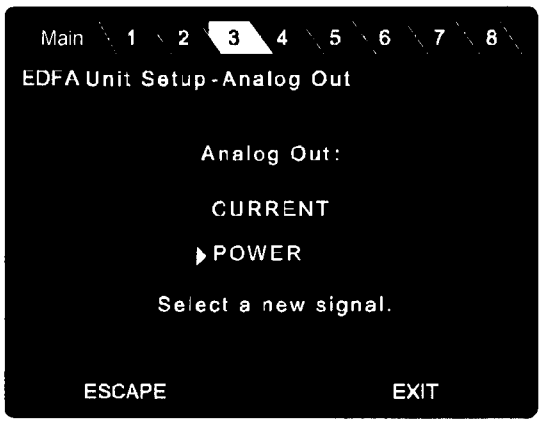


to the III.1 section).

NOTE: The parameters range is limited by the OSICS-ASE software.

III.4.3 Analog Out

In this menu it is possible to select the signal (Pump laser forward current or output power) sent through the OUT1 rear panel BNC connector corresponding to the selected channel.



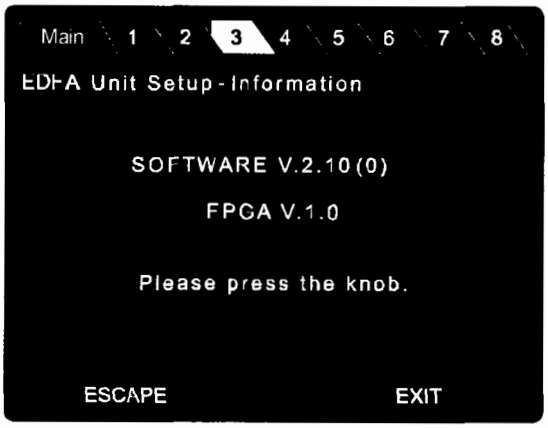
The voltage range is 0 to 10 V.

Signal levels are the following:

- Current: 35 mA/V
- Power: 20 mW/V

III.4.4 Information

When the Information sub-menu is selected the system displays the module software revision version.



IV. THE RS-232C REMOTE CONTROL MODE

The RS-232C remote mode is automatically entered when the unit receives a message through the serial interface ending with a Carriage Return "CR" character (even if the message itself is invalid). In the remote mode menu commands can be sent to the system through the RS-232C interface.

In the Remote mode the OSICS screen displays "**Mode:REMOTE**". To go back to the local mode press on the "**LOCAL**" button (the screen will display "**Mode:LOCAL**").

IV.1 Remote control Protocol

IV.1.1 Physical interface

The cable link is a three-wire RS-232C type using a 9–pin SUB-D connector. The OSICS serial port is configured as "Terminal" (DTE) : data sent to OSICS must be present on pin 2 of the connector and return messages from OSICS are on pin 3. The ground is through pin 5. No other connector pin is used:

RXD (to OSICS)..... 2

TXD (from OSICS)..... 3

GND..... 5

9-pin SUB-D connector pinout

The serial port is configured as follows:

Data transmission rate..... 9600 bauds

Number of bits.....8

Parity.....no

Stop bits.....1

This configuration is factory preset and cannot be changed by the user.

IV.1.2 Sent messages format

IV.1.2.1 Sending an instruction

All commands sent by the computer to OSICS via the the RS-232C interface are composed of a string of ASCII alphanumeric characters followed by a "carriage return" character (CR, or ASCII code 13). When such an instruction is received by OSICS the character string is decoded and the relevant procedure is carried out.

- Two kinds of messages can be used: Queries and Commands. Query messages contain a keyword followed by a question mark "?" and ask for a response. Command messages cause some action to happen in the instrument.

- Messages are sent using the following format:

instruction_string <CR> for the OSICS mainframe.
CHi: instruction_string <CR> for a specific channel corresponding to a plugged module.

- Instruction_string can be composed of a keyword with or without a question mark "?" or a parameter followed by an "=" sign and its value (control commands are described in the Appendix A).
- "CH" means "Channel" and i refers to the channel number: 1 to 8.

NOTE: "White space"[1] can be used inside the strings sent to OSICS at the beginning or after an instruction and before, after or instead of the "=" character. They cannot be used within an instruction mnemonic, within a numerical value, or between a mnemonic and the "?" character.

NOTE: OSICS does not distinguish between lower and upper case alphabetical characters.

---

[1] On the RS-232C interface, all characters with ASCII codes lower than or equal to 32, except the carriage return character (ASCII code 13) are considered as white space characters.

IV.1.2.2 Value format

The following format rules applies for setting parameters values:

- No "white spaces" characters are allowed within values (Refer to the IV.1.2.1 section note).
- Leading zero ("0") characters are allowed at the beginning of a value.
- Figures after the decimal point may be sent or omitted.
- Decimal coma is not equivalent to decimal point.
- Values are terminated by the "CR" character.
- No unit abbreviations must be sent.

Examples :

P= 0.22	Correct: 0.22 mW
P= 0,22	**Incorrect (not equivalent to 0.22 mW)**
L= 1530.2	Correct: 1530.200 nm
P= 01	Correct : 1 mW
P= 0.22	Correct (spaces before figure)
P= 0.22 mW	**Incorrect (no unit abbreviations)**
L= 1 530.2	**Incorrect (space between "1" and "5")**

IV.1.2.3 Sending series of instructions

It is possible to send a series of instructions for the mainframe and/or one or more modules in a single string. The different instructions will be analyzed as soon as the carriage return character "↵" is received.

Successive instructions are executed in sequence and must be separated by ";". Commands are sent to the mainframe when using ":" and to a specific channel if "CHi" is used (i refers to the channel number: 1 to 8).

An instruction for a given module can be processed in the same time than an instruction for another module. However a module can only process one instruction at the same time.

NOTE: If more than one command is sent to the mainframe or a channel in a single string it is only necessary to specify it one time before the first instruction. The instruction at the beginning of a string is always sent to the mainframe without using ":" unless a specific channel is specified.
Example: **mw? ; ch1 ; enable ; p=5 ; : nm** ask for the power unit on the mainframe, enable and set the power on 5 for the module plugged in the channel 1 and set the nm mode on the mainframe.

NOTE: OSICS input buffer is 255 characters long ; if more than 255 characters are sent in a single string, or before previous strings have been analyzed, the buffer will be cleared, all received instructions lost and the message "**Command Error**" sent.

IV.1.3 OSICS System response messages

After instructions completion OSICS always returns a message to the computer. This message informs that the requested procedure has been performed or an error has occurred.

IV.1.3.1 Response messages

- If the message received by OSICS is a query message, the answer is the requested numerical value.

- If there is no other appropriate response, the instrument responds with the string **OK**.

This response message is always terminated by the same end-of-message group: "↵" (= **carriage return**), ">" (= **"greater than"**) and "Space" (= **space character**). These three characters indicate that the OSICS system is ready to receive a new instruction and enable easy end-of-message detection.

Examples:

Computer to OSICS:	**>ch1:L?↵**	*(What is the current wavelength value?)*
OSICS to computer:	**CH1:L=1523.325↵**	*(current wavelength value)*
	>	*(OSICS is waiting for another instruction)*
Computer to OSICS:	**>ch2:P = 20↵**	*(Change optical power value to 20 mW)*
OSICS to computer:	**CH2:Execution Error↵**	*(power level over permitted maximum)*
	>	*(OSICS is waiting for another instruction)*

NOTE: The message syntax described above eases the management of the OSICS/computer interface since the computer must await the acknowledgement before sending a new instruction.

IV.1.3.2 Error handling

When an error occurs during interpretation of a message, the response is either **Execution Error, Command Error** or **Device Dependent Error** depending on the situation :

Command Error	This message will be returned if a command is not recognized by OSICS (syntax error...).
Execution Error	Sent if a command requesting a new parameter setting is correctly formulated but the specified value is outside the allowed range. In this case the parameter will remain unchanged.
Device Dependent Error	This response occurs if a command was correct but some condition in the instrument prevented this command from being executed.

IV.2 List of command

The main RS-232C control commands are described in Appendix A.

IV.3 ECHON instruction

ECHON instruction can be useful for visual monitoring of the characters keyed in at the terminal.

Command	*Action*	*OSICS answer*
ECHON	When this mode is active, the OSICS mainframe echoes each received character on the serial link. Since some terminals and terminal emulation programs do not feature local echo, this can be useful for visual monitoring of the characters keyed in at the terminal.	**OK**
ECHOFF	Cancels "echo" mode on the OSICS mainframe	**OK**

- These instructions are system instructions: no channel mnemonic should be inserted in front of these instructions, and no channel mnemonic will be included in the response.
- The default option is ECHOFF. Additionally, if the user exits the remote mode using the "**LOCAL**" key, and the remote operation is re-activated, the echo mode is switched to ECHOFF.

V. THE IEEE-488.2 REMOTE CONTROL MODE

The IEEE-488.2 remote control mode is entered as soon as OSICS is addressed as "listener" or "talker".

In the Remote mode the OSICS screen displays "Mode:REMOTE ". To go back to the local mode press on the "LOCAL" button (the screen will display "Mode:LOCAL").
A local lockout mode is possible (see the V.5 section).

V.1 GPIB communications on the OSICS

The "GPIB" communication link of OSICS is compatible with the standard IEEE-488.2. The purpose of the normalized IEEE-488 bus is to allow communication between instruments and computers through a specialized parallel interface. The maximum information flow rate is 1 megabyte/sec, and the information transfers are highly secured. It is often used to automate measurement processes.
The standard configuration is composed of a controller device (which is usually a computer) linked to various instruments. The controller initiates dialogs either between itself and one or more instruments, or between instruments. At any time, one « talker » and one or several « listeners » are present on the bus. Data sent on the bus is encoded in ASCII strings.
Each instrument on the bus is identified by its address. This address is an integer ranging between 1 and 30. For each instrument, different control registers can be used to determine the instrument operation state. The default OSICS GPIB address is 10 but it can be changed (see the V.4 section).

V.1.1 GPIB functions on the OSICS

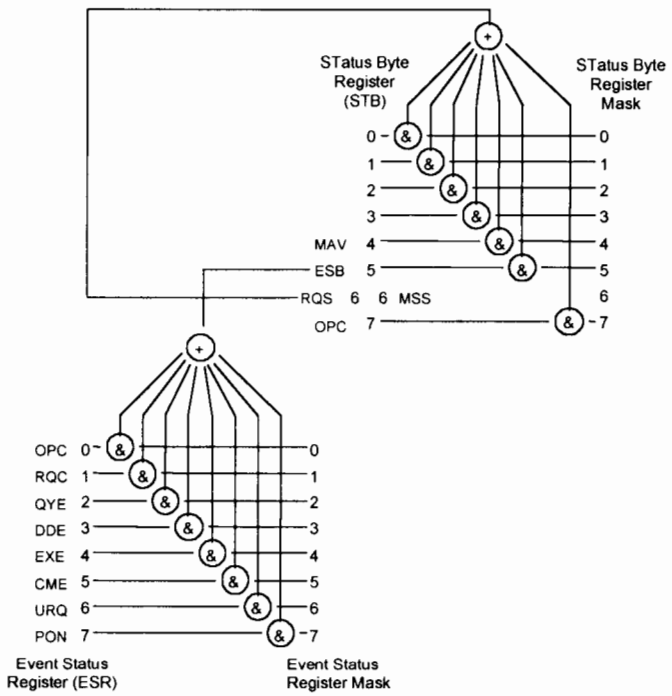
The following chart describes the GPIB functions available on OSICS:

Mnemonic	Meaning	Implementation
SH1	Source handshake	Complete
AH1	Acceptor handshake	Complete
T5	Talker	Complete
L3	Listener	Complete
SR1	Service request	Complete
RL1	Remote / Local	Complete
PP0	Parallel poll	No
DC1	Device clear	Complete
DT0	Device trigger	No
C0	Controller	No

V.1.2 Status word structure

Control registers and related commands

The following figure represents the status word structure, according to the IEEE-488.2 standard.



The meaning of each bit is described hereafter:

STATUS BYTE REGISTER (STB):

Bit number	*Name*	*Meaning*
7	**OPC** (OPeration Complete)	Indicates the end of the last command execution.
6	**RQS** (ReQuest Service)	Set when a service request has been sent by the instrument. This bit i cleared when the bus controller reads the status register.
6	**MSS** (Master Summary Status)	Set at the same time as the RQS bit ; this bit remains true as long as th condition which lead to a service request exists. It is cleared as soon a this condition disappears. This bit can be read by the *STB ? command.
5	**ESB** (Event Status Bit)	Standard event register summary bit.
4	**MAV** (Message AVailable)	Set when a message is placed in the output buffer ; this bit remains tru as long as the output buffer is not empty.

STANDARD EVENT STATUS REGISTER (ESR):

Bit number	*Name*	*Meaning*
7	**PON** (Power ON)	This bit is set once the instrument initialization has been completed.
6	**URQ** (User ReQuest)	Used to indicate that a front panel key has been pressed.
5	**CME** (ComMand Error)	Set to indicate a syntax error or a command string error.
4	**EXE** (EXecution Error)	Set when a parameter value is outside the valid range, or when command cannot be executed.
3	**DDE** (Device Dependent Error)	Set when an instrument limit has been reached.
2	**QYE** (QuerrY Error)	Set to indicate that the controller attempted to read an answer when n answer was available, or that answers have been lost.
1	**RQC** (ReQuest Control)	This bit can not be modified because the OSICS is not an IEEE bu controller.
0	**OPC** (OPeration Complete)	Set once a command line has been completely executed. (except i some special cases).

The Event Status Register is cleared each time it is read by the controller. When the execution of a command line begins, the OPC bit is cleared.

Two mask registers are associated with the Status Byte register (STB) and the standard Event Status Register (ESR). These masks are used to control the service request operation of the instrument. In the status and standard event registers, individual bits are validated by setting the corresponding bit in the mask register. Once the required bits have been set in each mask register, the summary bit will become true when the corresponding status or event register bits become true.

The summary bit is obtained by performing first a logical AND between each register and the corresponding mask register, then a logical OR between all individual bits of the result.

V.2 Remote control Protocol

V.2.1 System status informations

To accelerate and secure the exchange of informations between the controller and OSICS, we recommend to check the values of the status register and the standard event status register. These status words contains the information enabling the controller to know the status of commands received by OSICS, and therefore to decide when a new instruction can be sent or when the requested parameter can be read.

This applies particularly in two common cases :

- **When reading a parameter value:** the bit MAV (Message AVailable) indicates that the requested parameter value has been measured and that the answer message is available.

- **When instructing OSICS to perform some action:** the OPC bit (OPeration Complete) is cleared while the instruction is being processed, and set once it has been completed. This is particularly useful when setting a channel to a new wavelength, as this operation may take a few seconds.

V.2.2 Sent messages format

The basic procedure of communication is quite simple: the instructions are sent by the controller on the GPIB link with one string of ASCII characters for each instruction. These instructions can be either definition instructions for the operation of OSICS (eg. "ch1:P=5" means "Set the level of the output power to 5 mW on channel 1") or queries for a parameter value (eg. "ch3:P?" ask for the value of the output power on channel 3). Each instruction/query is immediately handled by OSICS microprocessor.

Addressing OSICS as the "talker" does the reading of the value; the value is transmitted by OSICS on the GPIB link. For example, if the power value has been requested by the computer (instruction "ch3:P?") and the OSICS is addressed as "talker," the transmitted response on the link will be like "CH3:P=35".

The following protocol applies for the transmission and reception of messages:

V.2.2.1 Sending an instruction

All commands sent by the computer to OSICS via the the IEEE-488.2 interface are composed of a string of ASCII alphanumeric characters followed by a "line-feed" character (LF, ASCII code10) or the "EOI" GPIB message (or both). When such an instruction is received by OSICS the character string is decoded and the relevant procedure is carried out.

- Two kinds of messages can be used: Queries and Commands. Query messages contain a keyword followed by a question mark "?" and ask for a response. Command messages cause some action to happen in the instrument.

- Messages are sent using the following format:

instruction_string <CR> for the OSICS mainframe.
CHi: instruction_string <CR> for a specific channel corresponding to a plugged module.

- Instruction_string can be composed of a keyword with or without a question mark "?" or a parameter followed by an "=" sign and its value (control commands are described in the Appendix A).

- "CH" means "Channel" and i refers to the channel number: 1 to 8.

NOTE: "White space"[2] can be used inside the strings sent to OSICS at the beginning or after an instruction and before, after or instead of the "=" character. They cannot be used either within an instruction mnemonic, within a numerical value, or between a mnemonic and the "?" character.

NOTE: OSICS does not distinguish between lower and upper case alphabetical characters.

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[2] On the IEEE-488.2 interface, all characters with ASCII codes lower than or equal to 32, except the line feed character (ASCII code 10) are considered as white space characters.

V.2.2.2 Value format

The following format rules applies for setting parameters values:

- Numerical values must be transmitted in a fixed-decimal-point format for non-integer values (eg. wavelength value) and without a decimal point for integer values (eg. validation byte of the request condition for service of the SRE instruction).
- No "white spaces" characters are allowed within values (Refer to the IV.1.2.1 section note).
- Leading zero ("0") characters are allowed at the beginning of a value.
- Figures after the decimal point may be sent or omitted.
- Decimal coma is not equivalent to decimal point.
- Values are terminated by the "line-feed" character.
- No unit abbreviations must be sent.

Examples :

P= 0.22	Correct: 0.22 mW
P= 0,22	**Incorrect (not equivalent to 0.22 mW)**
L= 1530.2	Correct: 1530.200 nm
P= 01	Correct : 1 mW
P= 0.22	Correct (spaces before figure)
P= 0.22 mW	**Incorrect (no unit abbreviations)**
L= 1 530.2	**Incorrect (space between "1" and "5")**

V.2.2.3 Sending series of instructions

It is possible to send a series of instructions for the mainframe and/or one or more modules in a single string. The different instructions will be analyzed as soon as the "line-feed" character is received.

Successive instructions are executed in sequence and must be separated by ";". Commands are sent to the mainframe when using ":" and to a specific channel if "CHi" is used (i refers to the channel number: 1 to 8).

An instruction for a given module can be processed in the same time than an instruction for another module. However a module can only process one instruction at the same time.

NOTE: If more than one command is sent to the mainframe or a channel in a single string it is only necessary to specify it one time before the first instruction. The instruction at the beginning of a string is always sent to the mainframe without using ":" unless a specific channel is specified.
Example: **mw? ; ch1 ; enable ; p=5 ; : nm** ask for the power unit on the mainframe, enable and set the power on 5 for the module plugged in the channel 1 and set the nm mode on the mainframe.

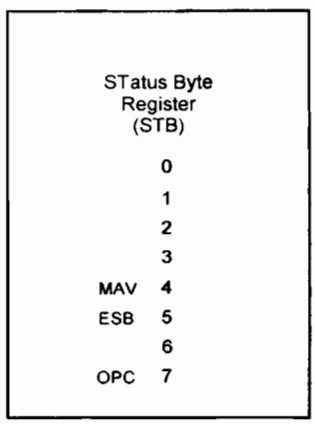
NOTE: OSICS input buffer is 255 characters long ; if more than 255 characters are sent in a single string, or before previous strings have been analyzed, the buffer will be cleared and all received instructions lost (this is a "**Command Error**").

V.2.3 OSICS System response messages

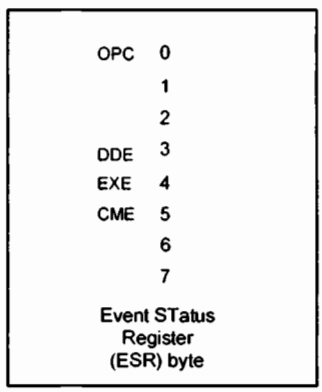
V.2.3.1 System status informations

To ensure a proper sequence of events, it may be useful to use the system status information. This information is summarized in two registers: the STatus Byte Register (STB) and the standard Event Status Register (ESR). Various bits in these register indicate the result of the last processed command and the type of possible error.

- **The STB byte** is read either through a serial poll or as a response to the *STB? query; for the most commonly used control method, bit #4 (MAV) is the only relevant bit in this status byte.



- **The ESR byte** is read as a response to the *ESR? query. The relevant bits in this control byte are bits 0 (OPeration Complete : OPC), 3 (Device Dependant Error : DDE), 4 (EXecution Error : EXE) and 5 (CoMmand Error : CME).



CAUTION: Reading of the ESR byte clears all the bits of this register. It is therefore important to analyse all bits that may be relevant each time this byte is read, otherwise some information may be lost.

NOTE: The standard IEEE-488.2 control instructions can be found in Appendix B.

V.2.3.2 Response messages

After instructions completion OSICS does not always returns a message to the computer. An answer is only returned if the message received by OSICS is a query message: the response is the answer to the query.

V.2.3.3 Message synchronization

When a command is executed with no errors, the two status bytes can be used in two main cases :

- **To ensure that a command has been completely executed before proceeding to some other operation** (for example when setting a channel to a new wavelength as this operation may take several seconds to complete). This can be checked through the OPC flag (bit 7 of STB). This flag remains false (0) as long as a command line has not been completely executed, and is set to 1, afterwards. The computer should test this flag until it becomes true, and then only proceed to the next instruction. In this case the STB byte must be read through a serial poll.

- **When a query message has been sent, the computer must wait until the answer is ready before reading it.** This is signaled by the MAV flag (bit 4 of the STB byte). In this case the STB byte must be read through a serial poll. This flag remains false (its value is 0) until a complete message is ready for reading. The computer should thus repeatedly read this flag until it becomes true (i.e. equal to 1), and then only read the answer to the query message. If several requests have been made in a single message, bit MAV will stay true until all answer messages have been read by the computer.

V.2.3.4 Error handling

When a command is sent to OSICS, several types of errors can occur :

CoMmand error (CME)	the command was not understood by OSICS, due to a syntax error or a mnemonic error.	Bit 5 of ESR is set.
EXecution Error (EXE)	the command was properly understood, but the corresponding parameter was outside the authorized range.	Bit 4 of ESR is set.
Device Dependent Error (DDE)	the command was correct but some condition in the instrument prevented this command from being executed.	Bit 3 of ESR is set.

It is recommended to read the ESR byte every time a command is sent in order to check for any errors, and eventually correct the source of the error.

CAUTION: Reading of the ESR byte clears all the bits of this register. Therefore it is important to analyse all bits that may be relevant each time this byte is read, otherwise some information may be lost.

V.3 List of commands

The main IEEE-488.2 control commands are described in Appendix B.

V.4 Change of the GPIB Address

At the time of the OSICS system's factory configuration, its address on the GPIB bus is 10. This address can be changed through the "Main Setup-GPIB Address" menu (Refer to the III.3.5 section).

When the GPIB address has been changed the new value is stored in non volatile memory and it is therefore retained even if OSICS is turned off. This new value replaces the initial value of the address.

V.5 Local Lockout

When OSICS receives a message through its IEEE-488.2 interface, it switches automatically to the remote mode of operation and the "**mode:REMOTE**" message is displayed on the screen. In this operating mode all OSICS front panel keys are disabled. The local operating mode can be re-activated by pressing the "**LOCAL**" button.

If the Local lockout command is sent to OSICS through the GPIB link the remote mode cannot be disabled through the front panel controls. The only way to resume OSICS to the local mode is by sending with the computer the Go to local command. The message "**System Status – LOCAL LOCKOUT**" is displayed if the "**LOCAL**" button is pressed.

APPENDIX A: RS-232C CONTROL COMMANDS

A.1 RS-232C INSTRUCTIONS FOR THE OSICS MAINFRAME

A.1.1 Changing parameter settings

Command	*Action*	*OSICS answer*
MOD_F =nnnnnn	Sets the mainframe internally generated signal frequency (between 200 Hz and 500 kHz). However the mainframe can't generate some frequency values: in this case the mainframe selects the frequency value just under the entered value. The MOD_F? command displays the frequency value used by the mainframe.	**OK**
P=nn.nn	Sets the optical power on every OSICS modules. (mW mode active: refer to MW command).	**OK**
P=(±)nn.nn	Sets the optical power on every OSICS modules. (DBM mode active: refer to MW command).	**OK**

Note: "n" is a numerical value between 0 and 9.

A.1.2 Changing operating modes

Command	*Action*	*OSICS answer*
DBM	Selects dBm unit for transmission of optical power values on every modules.	**OK**
DISABLE	Disables the laser output on every modules.	**OK**
ENABLE	Enables the laser output on every modules.	**OK**
GHZ	Selects GHz unit (optical frequency mode) for displayed value on every modules	**OK**
MOD_SRC EXT	Sets the same modulation source on every modules EXT: external signal	**OK**
MOD_SRC INT	Sets the same modulation source on every modules INT: internally generated signal	**OK**
MW	Selects mW unit for transmission of optical power values on every modules.	**OK**
NM	Selects nm unit (wavelength mode) for displayed value on every modules	**OK**

A.1.3 Reading parameters and modes

Command	*Action*	*OSICS answer*
ENABLE?	Requests laser output mode.	**ENABLED** or **DISABLED**
INTERLOCK?	Requests interlock mode On Off	**1** **0**
MOD_SRC?	Requests the modules modulation source.	**MOD_SRC=INT** or **MOD_SRC=EXT**
MOD_F?	Requests the present internally generated signal frequency	**MOD_F= nnnnnn**
MW?	Requests present power unit mW unit dBm unit	**1** **0**
NM?	Requests wavelength (or frequency) unit nm unit GHz unit	**1** **0**
P?	Requests present power output level	**P=nn.nn** (mW unit active) **P=±nn.nn** (dBm unit active)
PRESENT? 1 or **PRESENT? 2** or **PRESENT? 3** or **PRESENT? 4** or **PRESENT? 5** or **PRESENT? 6** or **PRESENT? 7** or **PRESENT? 8**	Requests module code in a given slot (from 1 to 8) No module code ECL module code DFB module code ASE module code	 **-1** **1** **2** **3**

Note: The parameter can be read any time.

A.1.4 Saving and loading parameters

Command	*Action*	*OSICS answer*
RECALL A or **RECALL B** or **RECALL C** or **RECALL D**	Recall an OSICS configuration from the A, B, C or D memory location	**OK**
RECALL DEFAULT	Recall an OSICS configuration from the DEFAULT memory location	**OK**
RECALL STARTUP	Recall an OSICS configuration from the STARTUP memory location	**OK**
SAVE A or **SAVE B** or **SAVE C** or **SAVE D**	Save the OSICS configuration in the A, B, C or D memory location	**OK**
SAVE STARTUP	Save the OSICS configuration in the STARTUP memory location	**OK**

A.1.5 Other commands

Command	*Action*	*OSICS answer*
***IDN?**	Requests identification message	**PHOTONETIC,OSICS,0,n.nn** (where n.nn is the software release).
***RST**	The input buffer is cleared. The command interpreter is reset and a reset instruction is sent to every modules. The status and event registers are cleared. Sets the OPC bit to 1.	**OK**

A.2 RS-232C INSTRUCTIONS FOR THE OSICS-EDFA MODULE

- All instructions for the OSICS-EDFA module are channel-specific instructions.
- The string must begin with the channel selection mnemonic CHi: where i stands for the channel number corresponding to a plugged module (from 1 to 8) (e.g. CH1:P=01.20). This mnemonic has been omitted in the following list for more clarity.
- Likewise, all answers to channel specific instructions start with the channel number mnemonic (e.g. CH2:OK, or CH2:L=1552.23).

A.2.1 Changing channel parameters settings

Command	*Action*
P=nn.nn	Sets the optical pump diode power on the OSICS-EDFA module. (mW mode active: refer to MW command).
P=(±)nn.nn	Sets the optical pump diode power on the OSICS-EDFA module. (dBm mode active: refer to DBM command).

Note: "n" is a numerical value between 0 and 9.

A.2.2 Changing channel operating modes

Command	*Action*
AOUT I	Sets a Current signal on the OUT1 rear panel BNC
AOUT P	Sets a Power signal on the OUT1 rear panel BNC
DISABLE	Disables the optical amplifier output.
ENABLE	Enables the optical amplifier output.

A.2.3 Reading channel parameters

Command	*Action*	*OSICS answer*
AOUT?	Requests the OUT1 rear panel BNC signal	**AOUT=P; AOUT=I**
ENABLE?	Requests amplifier output mode	**ENABLED** or **DISABLED**
ERRORT?	Requests temperature error Temperature error Otherwise	**1** **0**
FIRM?	Requests software release	**FIRM=n.nn**
I?	Requests present pump diode current level (mA)	**I=nn.n**
IMAX?	Requests pump diode maximum current (mA)	**IMAX=<value>**
LIMIT?	Requests if the current is limited Otherwise	**1** **0**
MW?	Requests present power unit. mW unit dBm unit	**1** **0**
P?	Requests present pump diode power level	**P=nn.nn** (mW unit active) or **P=±nn.nn** (dBm unit active)

Note: Channel parameters for power output, current level and wavelength can be read at any time.

APPENDIX B: IEEE 488-2 CONTROL COMMANDS

B.1 IEEE 488-2 INSTRUCTIONS FOR THE OSICS MAINFRAME

B.1.1 Changing parameter settings

Command	*Action*
MOD_F =nnnnnn	Sets the mainframe internally generated signal frequency (between 200 Hz and 500 kHz). However the mainframe can't generate some frequency values: in this case the mainframe selects the frequency value just under the entered value. The MOD_F? command displays the frequency value used by the mainframe.
P=nn.nn	Sets the optical power on every OSICS modules. (mW mode active: refer to MW command).
P=(±)nn.nn	Sets the optical power on every OSICS modules. (DBM mode active: refer to MW command).

Note: "n" is a numerical value between 0 and 9.

B.1.2 Changing operating modes

Command	*Action*
DBM	Selects dBm unit for transmission of optical power values on every modules.
DISABLE	Disables the laser output on every modules.
ENABLE	Enables the laser output on every modules.
GHZ	Selects GHz unit (optical frequency mode) for displayed value on every modules
MOD_SRC EXT	Sets the same modulation source on every modules EXT: external signal
MOD_SRC INT	Sets the same modulation source on every modules INT: internally generated signal
MW	Selects mW unit for transmission of optical power values on every modules.
NM	Selects nm unit (wavelength mode) for displayed value on every modules

B.1.3 Reading parameters and modes

Command	*Action*		*OSICS answer*
ENABLE?	Requests laser output mode.		**ENABLED** or **DISABLED**
INTERLOCK?	Requests interlock mode	On	1
		Off	0
MOD_SRC?	Requests the modules modulation source.		**MOD_SRC=INT** or **MOD_SRC=EXT**
MOD_F?	Requests the present internally generated signal frequency		**MOD_F= nnnnnn**
MW?	Requests present power unit	mW unit	**1**
		dBm unit	**0**
NM?	Requests wavelength (or frequency) unit	nm unit	**1**
		GHz unit	**0**
P?	Requests present power output level		**P=nn.n** (mW unit active) **P=±nn.n** (dBm unit active)
PRESENT? 1	Requests module code in a given slot (from 1 to 8)		
or **PRESENT? 2**		No module code	**-1**
or **PRESENT? 3**		ECL module code	**1**
or **PRESENT? 4**		DFB module code	**2**
or **PRESENT? 5**		ASE module code	**3**
or **PRESENT? 6**		EDFA module code	**4**
or **PRESENT? 7**			
or **PRESENT? 8**			

Note: The parameters can be read at any time.

B.1.4 Saving and loading parameters

Command	*Action*
RECALL A or **RECALL B** or **RECALL C** or **RECALL D**	Recall an OSICS configuration from the A, B, C or D memory location
RECALL DEFAULT	Recall an OSICS configuration from the DEFAULT memory location
RECALL STARTUP	Recall an OSICS configuration from the STARTUP memory location
SAVE A or **SAVE B** or **SAVE C** or **SAVE D**	Save the OSICS configuration in the A, B, C or D memory location
SAVE STARTUP	Save the OSICS configuration in the STARTUP memory location

B.1.5 General IEEE 488-2 commands

- The main bus management instructions are described here.
- All standard GPIB bus management instructions start with a star ("*") character.
- No channel mnemonic should be inserted in front of these instructions.

Command	*Action*	*OSICS answer*
***CLS**	The standard event register is cleared. Sets OPC bit to 1. The CLS instruction is sent to each modules.	
***ESE**	The standard event mask register is set to a value equal to the argument of this command. If the argument is outside the interval 0 to 255, the Execution Error sequence is executed.	
***ESE?**	The value of the standard event register mask is copied into the output buffer.	Event Register **value between 0 and 255**
***ESR?**	Standard Event Status Register query. The value of the standard event register is placed into the output buffer, and the standard event register is cleared.	Event Register **value between 0 and 255**
***IDN?**	IDeNtification query	**PHOTONETICS,OSICS,0,n.nn** (where n.nn is the software release).
***OPC**	Waits until the preceding commands of the present command string have been executed, and the OPeration Complete OPC bit has become true.	
***OPC?**	Waits until the preceding commands of the present command string have been executed ; the "1" character is placed in the output buffer, followed by the LF character.	**1**
***RST**	The input buffer is cleared. The command interpreter is reset and a reset instruction is sent to every modules. The status and event registers are cleared. Sets the OPC bit to 1.	
***SRE**	The status register mask is set to a value equal to the argument of this command. If the argument is outside the interval 0 to 255, the Execution Error sequence is executed.	
***SRE?**	The value of the status register mask is copied into the output buffer.	status register **value between 0 and 255.**
***STB?**	STatus Byte query. The value of the status register is copied into the output buffer. In this command, bit 6 of this value is the MSS bit rather than the RQS bit.	status byte **value between 0 and 255**
***WAI**	Waits until the preceding commands of the present command string have been executed.	

B.2 IEEE 488-2 Instructions for the OSICS-EDFA module

- All instructions for the OSICS-EDFA module are channel-specific instructions.
- The string must begin with the channel selection mnemonic CHi: where i stands for the channel number corresponding to a plugged module (from 1 to 8) (e.g. CH1:P=01.20). This mnemonic has been omitted in the following list for more clarity.
- Likewise, all answers to channel specific instructions start with the channel number mnemonic (e.g. CH2:L=1552.23).

B.2.1 Changing channel parameters settings

Command	*Action*
P=nn.nn	Sets the optical pump diode power on the OSICS-EDFA module. (mW mode active: refer to MW command).
P=(±)nn.nn	Sets the optical pump diode power on the OSICS-EDFA module. (dBm mode active: refer to DBM command).

Note: "n" is a numerical value between 0 and 9.

B.2.2 Changing channel operating modes

Command	*Action*
AOUT I	Sets a Current signal on the OUT1 rear panel BNC
AOUT P	Sets a Power signal on the OUT1 rear panel BNC
DISABLE	Disables the amplifier output.
ENABLE	Enables the amplifier output.

B.2.3 Reading channel parameters

Command	*Action*	*OSICS answer*
AOUT?	Requests the OUT1 rear panel BNC signal	**AOUT=P** or **AOUT=I**
ENABLE?	Requests amplifier output mode	**ENABLED** or **DISABLED**
ERRORT?	Requests temperature error Temperature error Otherwise	**1** **0**
FIRM?	Requests software release	**FIRM=n.nn**
I?	Requests present pump diode current level (mA)	**I=nn.n**
IMAX?	Requests pump diode maximum current (mA)	**IMAX=<value>**
LIMIT?	Requests if the current is limited Otherwise	**1** **0**
MW?	Requests present power unit. mW unit dBm unit	**1** **0**
P?	Requests present pump diode power output level	**P=nn.n** (mW unit active) or **P=±nn.n** (dBm unit active)

Note: Channel parameters for power output, current level an wavelength can be read at any time.

APPENDIX C: CHARACTERISTICS

SAFETY COMPLIANCE

Equipment type	Test and measuring
Safety Class	Class 1 (as defined in IEC 61010-1, annex H)- grounded product
Mains supply voltage	100 - 240 V AC with ± 10% fluctuation max
Installation (Overvoltage) category	**Overvoltage category II** (as defined in IEC 61010-1, Annex J) Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected.
Pollution Degree	**Pollution Degree 2** (as defined in IEC 61010-1). Note: rated for indoor use only. Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.
Safe operating temperature range	+10°C to +35°C
Maximum relative humidity	80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C
Altitude (maximum operating)	2000 meters

POWER SOURCE

Power supply	100 - 240 V AC ± 10%
Power supply frequency	50 - 60 Hz ± 5%
Max power consumption	120 W

MECHANICAL CHARACTERISTICS

- Mainframe

Dimensions	**Depth**	370 mm (14.6 in)
	Width	448 mm (17.6 in)
	Height	133 mm (5.2 in)
Weight	8.1 kg (17.86 lb)	

- Module

Dimensions	**Depth**	230 mm (9.1 in)
	Width	35 mm (1.4 in)
	Height	128 mm (5.0 in)
Weight	0.9 kg (1.98 lb)	

INTERFACES

Optical connectors (on the front panel of the OSICS-EDFA module)	"Wide Key" FC/APC (on Corguide™ SMF-28 fiber)
Output isolation	35 dB
Return loss	-60dB
Remote control IEEE-488.2	Yes
Remote control RS-232C	Yes

APPENDIX D: MAINTENANCE

User maintenance of the OSICS is limited to the following:

- Replacing the line Fuse.
- Cleaning optical connectors for optimum power.
- Checking the performance of optical connections and cables.
- Cleaning the instrument.
- Calibration.

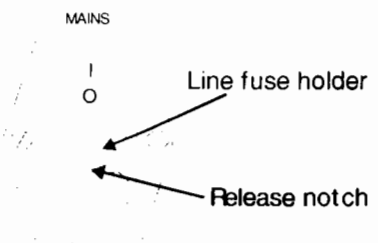
WARNING: DO NOT MAKE ANY SERVICE OR MAINTENANCE ON THE OSICS MODULE: Under no circumstance, the user has to make any service or maintenance of any kind on the OSICS module. The protective cover of the OSICS module must not be removed by the user. Refer servicing only to authorized personnel from Photonetics.

REPLACING THE LINE FUSE

Before replacing the Line Fuse be sure you unplug the power cord.

1- Insert a small flat-blade screwdriver into the notch just inside the power cord socket of the line filter. Use the notch to pull the fuse holder straight out to remove the fuse.

2- Replace the fuse (T4Amp L 250V) in the fuse holder and snap the fuse holder back into the lined filter.



CLEANING AND CARING FOR OPTICAL CONNECTORS AND FIBERS

- Handle optical fiber with appropriate care and preserve the integrity of optical connectors by keeping them free of contamination.

- Use the following items to clean the optical connectors:
  - clean compressed air
  - fiber-optic cleaning swabs
  - isopropyl alcohol

- Follow these steps to clean the optical connectors:

  1- Hold the can of compressed air upright and spray the can into the air to purge any propellant.

  2- Spray the clean compressed air on the connectors to remove any loose particles or moisture.

  3- Moisten a clean optical swab with isopropyl alcohol then lightly swab the surfaces of the connectors.

  4- Spray the clean compressed air on the connectors again to remove any loose particles or isopropyl alcohol.

NOTE: Cleaning kits for optical connectors are available from many fiber optic suppliers.



CAUTION: - To optimize the performance of the system and prevent loss of optical power or damage to the optical connectors, keep the connectors clean at all times.

- When cleaning the connectors with a swab, use gentle circular motions. Use only high quality cleaning supplies that are non-abrasive and leave no residue.

- To reduce the need for cleaning, immediately replace protective caps on the optical connectors when not in use.

- Do not over stress or sharply bend optical fiber beyond tolerances specified by the manufacturer.

CLEANING OF THE INSTRUMENT

If necessary, follow these steps to clean the OSICS instrument:

- Disconnect the instrument from the mains supply before cleaning.
- Clean with a cloth slightly damped with an isopropyl alcohol liquid.



CAUTION: Do not use chemically active or abrasive materials to clean the instrument.

CHECKING PERFORMANCES

If the performances do not meet warranted specifications, a complete servicing of the instrument may be required.

The complete servicing requires the adjustment or replacement of internal components and must be performed by Photonetics authorized personnel only

APPENDIX E: REPLACEABLE PARTS

For information about replaceable parts, contact your Photonetics sales representative.

STANDARD ACCESSORIES

Name	Description
Fuse	T4Amp L 250V
Manual, tech : instruction	OSICS-EDFA User manual
Optical fiber cable	single-mode cable

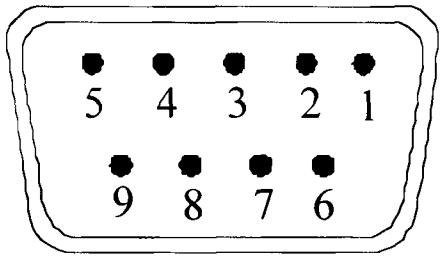
OPTIONAL POWER CORDS

Name		Description
North America	110 V, 60 Hz	CSA STD C22.2 NO21-M1984, ECN 436C approved, 5-15P attachment plug cap moulded onto No18 AWG, type SVT,SJT flexible cord, 2 meter (78.7 inch), 125V/10A AC, US
Universal European	220 V, 50 Hz	DIN 49441/2, CEE7, DIN 0625, VDE approved, IEC attachment plug cap, HO5VV-F3G 0.7 mm_ flexible cord, 2.5 meter (98.4 inch), 250V/10A AC, EUROPEAN
United Kingdom	240 V, 50 Hz	BS4491.EN60.320,BASEC BS6500, ASTA BS 1363A, VDE, SEV, BSI approved, 1.0 mm_ flexible cord, 2 meter (78.7 inch), 250V/10A AC, 25.4 mm fused UK plug (13A fuse)

APPENDIX F: REMOTE INTERLOCK

- The rear panel contains the Sub-D9 connector used for remote interlock. To use the Remote Interlock function, the user must provide a connector with pins 1 and 2 shortened, the external switch being connected to pins 6 and 7. The switch must be electrically isolated from all other circuits, including earth ground. When nothing is connected to the Remote Interlock connector, the OSICS can be used as usual.

Pin numbers	External connections
1 and 2	short-circuit
6 and 7	External switch

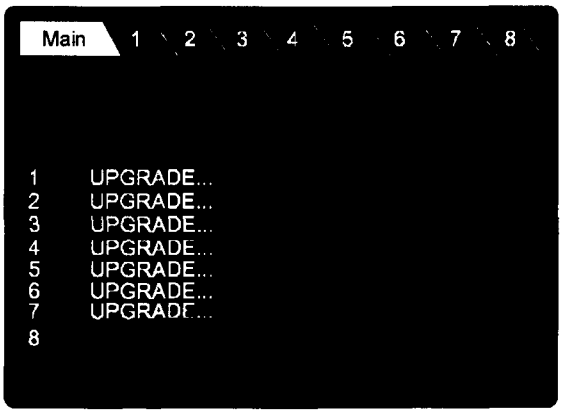


- When the Remote Interlock mode becomes active all the plugged modules are disabled and the ENABLE key is inactive. The modules keeps the disable configuration when the Interlock mode goes back to the inactive mode.

- Select the PC port (1 or 2) where the RS-232C cable is connected.

- Select ASE in the module area. All the modules plugged in the rack are selected: it is a default choice. To select only another OSICS-EDFA module click on its slot (to select every modules plugged-in click on ALL)

- To start the update click on PROGRAM in the "Action" area. The upgrade is beginning: the OSICS rack is re-initialized and the message "**Upgrade...**" is displayed on the OSICS System status screen for the corresponding channel. The "UPDATING" message is displayed in the "Status" area and the "Progress" area displays the progress report on the computer screen.



- When the upgrade is ended the "SUCCESS" message is displayed on the "status" area of the computer screen. It is possible to check the software version change by having a look at the "EDFA Unit Setup-Information" sub-menu: the new module software revision version will be displayed.

CONTACTING PHOTONETICS

Service support:

Contact your local Photonetics distributor or sales office.

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